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Review

Communicating airport noise emission data to the general public

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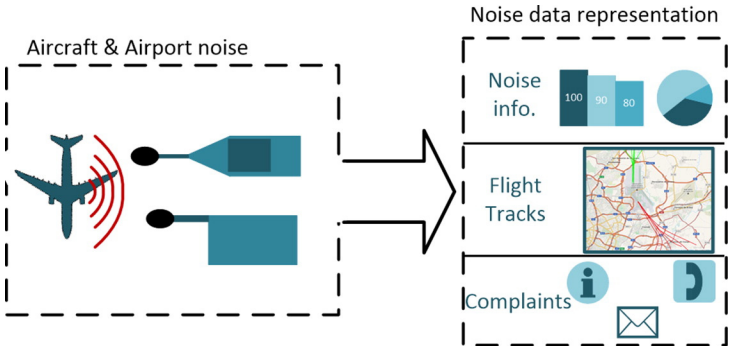
HIGHLIGHTS

- We reviewed how airports communicate noise information to the public.
- We analysed the most common noise indicators used in airports from Europe, the United States of America, and Australia.
- We described the different visualizations that airports use to communicate noise information.
- We reviewed new tools airports can use to interactively present noise information that citizens can easily understand.

GRAPHICAL ABSTRACT



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ABSTRACT

Despite the efforts that the aviation industry has undertaken during the last few decades, noise annoyance remains high, partly because of the continuous transport demands of modern societies and partly because of changes in citizen expectations and their growing environmental concerns. Although modern aircraft are considerably quieter than their predecessors, the number of complaints has not decreased as much as expected. Therefore, the aeronautical sector has tried more sociological and/or psychological strategies to gain acceptance through awareness and community engagement. In this regard, noise communication to the public is crucial for managers and policy makers. Noise information is a difficult technical topic for non-experts, which is an issue that must first be addressed to take advantage of the new possibilities that have recently been opened by the internet and information and communication technologies.

In this review paper, we have compiled the literature that shows the increasing importance of communicating noise information from aircraft and the variety of indicators used to communicate with the public. We also examined the methods of representing noise data, using visualization strategies, and new tools airports are currently using to address this communication problem.

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1. Introduction

In the Transport White Paper, the European Commission states that transport is one of the main pillars that support economic growth and job creation (European Union, 2011). The future well-being of a society depends on the capacity of every region being integrated in the global economy. To achieve this goal, it is essential to have an efficient transport infrastructure, which also needs to be compatible with the environmental and resources constraints. Transport infrastructure determines the mobility in a region. Investments in infrastructure positively impact economic growth as they create wealth and jobs, and infrastructure fosters commercial exchange, geographical accessibility, and mobility of people. To achieve sustainable growth, it is necessary to minimize the negative impact on the environment, one of the main causes of which is acoustic emissions.

Noise greatly determines the degree to which a community accepts transport infrastructure, especially for airports. Noise is one of the major reasons for complaints in relation to aircraft operations at airports, and it is the main problem residents and neighbours cite when the expansion of an airport is suggested (Brooker, 2008). For several decades, the aeronautical sector has focused on noise as one of its most important issues and has expended many resources to improve and track its assessment as well as communication strategies to increase community engagement.

This paper offers a general overview of the different initiatives that have been undertaken to inform citizens about noise emissions from aircraft. The methodology followed in this review comprises four steps. The first step was analysing the historical communication of data in airports worldwide, examining laws, standards and technical reports in regions where airport development started and quickly evolved, such as Great Britain, USA, France and Netherlands. The second step was reviewing the works of Noise Working Groups from different organizations as well as noise research projects that considered visualization to be one of the final research objectives. The third step consisted of searching published papers in scientific databases, such as Scopus and ScienceDirect, using keywords such as “airport”, “index”, “metric”, “visualization”, “noise” and “aircraft”. We found many journals and papers related to aircraft and airport noise, especially related to new noise metrics, but only a few of them were linked with noise data visualization and were always associated with projects found during the second step. We also looked at the noise reports and web-tracking systems on the websites of 70 airports worldwide: 44 were in Europe, 5 in Australia, 11 in the United States of America (USA) and 10 in Mexico and South America. The criterion for including an airport was based on its importance in the region and its numbers of passengers and operations. Many airports do not provide public noise reports, especially in South America. Finally, we established the most common visualization used by airports and identified the particularities of some airports and regions.

Based on the results of our study, this review paper is divided into four sections. The first section is an historical background of the noise regulations developed in different countries worldwide. The second one compiles a list of the main indicators used to assess aviation noise. The third section describes the information that airport authorities most frequently provide to keep citizens informed about the airport's activity and noise emissions. The last section focuses on noise monitoring systems. The scope of this paper includes how this information is presented to the public, as this is an essential communication issue.

2. Historical background

In 2001, the International Civil Aviation Organization (ICAO) defined the concept of the balanced approach for the noise management of aircraft operations (International Civil Aviation Organization, 2008). The four aspects of the balanced approach are reducing the noise of the source, planning and land use management, implementing the quietest operating procedures, and providing operating restrictions. Many international airports, such as Heathrow, Sydney, Zurich and others, have used this approach to manage noise (Girvin, 2009; Heathrow Airport, 2013a; Licitra et al., 2014; Netjasov, 2016; Netjasov, 2012; Sydney Airport, 2005; Vogiatzis, 2014; Vogiatzis, 2012).

While noise emissions produced by airplanes are substantially lower than they were 15 years ago, the level of acceptance by citizens has not increased to the same extent (Babisch et al., 2009; Brooker, 2009), thus limiting the growth of airports. Furthermore, people who live farther from airports are exerting pressure to impose operational restrictions or to prevent airport growth.

One factor that determines whether citizens will reject transport infrastructure, especially airports, is noise annoyance. Therefore, the aeronautical sector continues to research how to best include citizens' attitudes and their subjective perceptions about noise problems in management strategies. In this regard, communication to the public is crucial, and information provided to citizens is one of the main action lines (Airports Council International, Civil Air Navigation Services Organisation, 2015; European Economic and Social Committee, 2015; Sustainable Aviation, 2014).

One of the first regulations related to noise mitigation that addressed providing acoustic data to the public was The Noise Control Act, which was established in 1972 in the USA (U.S. Congress, 1972). Sometime later, Europe began enacting such regulations, starting with the Noise Nuisance Act (Wer geluidhinder) from the Netherlands, which was approved in 1979 (States General of the Netherlands, Staten-Generaal van het Koninkrijk der Nederlanden, 1979). In 1985, Town Planning Law 85–696 was approved in France, establishing the requirement for developing noise maps for airports and sharing them with the public (République Française, 1985). During the following years, many laws appeared in different European countries, and in 1996, the European Union began a process to unify the efforts of state members to mitigate noise effects with the publication of the Green Paper (European Parliament, 1996). Amongst other measures, the Green Paper noted the need to inform citizens about noise exposure in order to raise awareness and to encourage changes in behaviour, giving them the opportunity to influence decision makers and the general public.

The Green Paper served as a basis for the Environmental Noise Directive (END), which was adopted in 2002 as a common regulatory framework for environmental noise management in Europe, including

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